Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. **February, 1934.** **No. 422.**

THE POLLINATION OF KALMIA ANGUSTIFOLIA[1]

JOHN H. LOVELL AND HARVEY B. LOVELL

THE explosive mechanism of *Kalmia latifolia* L. was described by Conrad Sprengel in 1793, but he supposed that it was designed to secure self-pollination. In 1863 Hasskarl[2] likewise was of the opinion that self-pollination occurs spontaneously in this species. The floral mechanism of *K. angustifolia* L. was discussed briefly by Rothrock[3] in 1867, who observed that the release of the stamens by insects not only threw pollen on the stigma of the same flower, but also upon the stigmas of adjacent flowers.

W. J. Beal[4] seems to have been the first to observe and describe the manner in which the flowers of *Kalmia* are cross-pollinated by insects. He observed the honey-bee and "other Hymenoptera" spring the stamens and become showered with pollen. Flowers covered with netting to exclude insects usually withered without the anthers being set free.

None of the above writers collected or identified the insects which visit either species of *Kalmia*, and in many other respects their observations are either incomplete or inaccurate. In particular the smaller and more northern sheep laurel (*K. angustifolia* L.) has been studied very little. At Waldoboro, Maine, the sheep laurel is very abundant in many neglected pastures, where it is associated with

[1] Published with aid to RHODORA from the National Academy of Sciences.

[2] Hasskarl, J. C. 1863. Über Kalmia latifolia. Bot. Zeit. Leipzig. **21**: 237–239.

[3] Rothrock, J. T. 1867. The fertilization of flowering plants. Am. Natur. **1**: 64–72. This account contains several errors.

[4] Beal, W. J. 1867. Agency of insects in fertilizing plants. Am. Natur. **1**: 254–260.

the earlier blooming rhodora (*Rhododendron canadense*).[4] Farmers often confuse the two shrubs and believe that a single bush bears both kinds of flowers.

The umbel-like corymbs of numerous red flowers of *K. angustifolia* are borne on the shoots of the previous season. The corolla is saucer-shaped, about 12 mm. broad, with a very short tube. There is no noticeable odor. The upper flowers of a corymb may be imperfectly developed, the corolla being white, with no pouches, and the stamens and pistil standing erect and of equal length.

At the beginning of anthesis a small opening appears at the end of the flower-bud, through which the style protrudes for about 3 mm. The capitate stigma is in a receptive condition, and at this stage

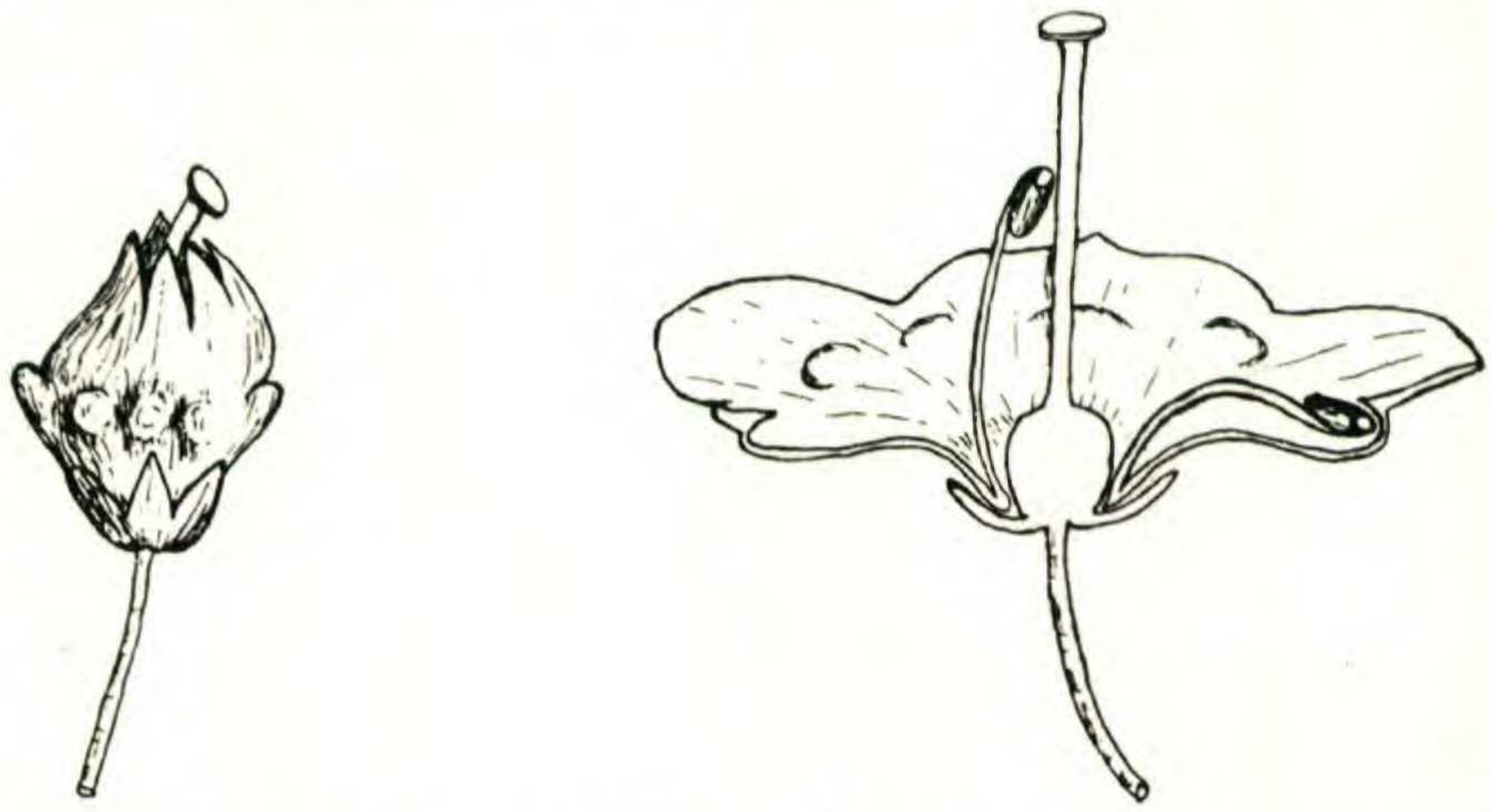

FIG. 1. Bud and expanded flower of KALMIA ANGUSTIFOLIA, × 4.

only cross-pollination is possible. Bees were frequently observed visiting the flowers for nectar at this stage.

The pollen is not discharged until the flower is fully expanded. The ten dark purple anthers are held in ten pouches in the corolla-limb, so formed that they prevent the anthers from springing out prematurely. The filaments are white, flat, and strongly bowed upward, in a state of elastic tension. Many flower clusters, while still in bud, were placed in water, where insects could not have access to them, and kept under observation daily. Since none of the stamens became free, it is evident that the anthers can not release themselves spontaneously.

In the field we have frequently seen the stamens sprung by *Bombus ternarius* and *Andrena vicina*, and more rarely by such small bees as

[4] Lovell, J. H. and H. B. Lovell. Pollination of Rhodora. RHODORA, **34**: 213–214.

Andrena claytoniae. A large bee when alighting on the flower first touches the projecting stigma with the ventral part of its body, and as it inserts its proboscis between the filaments and the corolla tube to gather nectar, its legs set free the stamens and a cloud of pollen is thrown over its body. Upon microscopic examination the hairs on the ventral side of the body of such bees were found loaded with pollen. The hairs on the base of the filaments may cling to the legs of the insects and aid in releasing the anthers. When a filament is touched with a needle, the anthers spring upward, scattering a little cloud of white pollen from two large pores at the apex of the anther. The stamens then stand erect for two or three hours, with their anthers in contact with the style, about three millimeters below the stigma, after which the filaments bend backward and the anthers again rest on the corolla.

The light, dry pollen may be carried by a gentle breeze a distance of a foot or more to other flower clusters, so that cross-pollination by the aid of the wind may occur as in Erica and Calluna. Autogamy is not probable, but it is not excluded.

Nectar is secreted sparingly between the base of the filament and the corolla tube. In a great number of flowers no trace of it could be discovered, but in a few flowers it was moderately abundant. This accounts for the comparatively small number of insect visits received by the bloom. Only 12 to 18 insects were usually captured during two hours of collecting. Though an apiary was located only a third of a mile away, not a single honey-bee was seen visiting the bloom, but in the same pasture many of them were gathering nectar from white clover. On the base of the corolla there are a dozen or more dark red triangular spots which possibly may serve as honey guides.

Insect visits to the sheep laurel are so rare that a few observations might easily lead to the conclusion that they are not numerous enough to effect pollination. Not a single species of Diptera was captured, and there were only a few visits by butterflies. Diurnal clear-winged hawk-moths were seen to probe the flowers occasionally, but since they do not alight are probably of no assistance in pollination.

The most common visitor is *Bombus ternarius*, and on a day following a heavy rain they were so abundant that most of the fully expanded flowers were found to have had their stamens sprung. *Andrena vicina* was also a very common visitor. Long continued ob-

servations show that the inflorescence of *Kalmia angustifolia* is effectively cross-pollinated by bees.

The following visitors were taken on the flowers from June 21 to July 12 at Waldoboro, Maine.

APOIDEA: BOMBUS TERNARIUS Say ♀ ☿; B. TERRICOLA Kirby ☿; B. VAGANS Sm. ☿; PSITHYRUS ASHTONI Cr. ♀; ANDRENA VICINA Sm. ♀; A. CLAYTONIAE Rob. ♀; A. sp. ♀; AUGOCHLORA CONFUSA Rob. ♀; NOMADA FLORILEGUS Lovell & Ckll. ♀; CILISSA AMERICANA Sm. ♀; COLLETES MESOCOMUS Swenck ♀ ♂ (This bee has been found only on this flower and at Waldoboro).

LEPIDOPTERA—Butterflies: ARGYNNIS APHRODITE Fab.; COLIAS PHILODICE Godt.; MELITAEA NYCTEIS Doubl. Moths: A clear-winged hawk-moth (not captured), probably HEMARIS DIFFINIS.

COLEOPTERA—CERAMBYCIDAE: LEPTURA CHRYSOCOMA Kirby.

WALDOBORO, MAINE.

NOTES ON THE SPRING FLORA OF THE COASTAL PLAIN OF SOUTH CAROLINA NORTH OF GEORGETOWN[1]

C. A. WEATHERBY AND LUDLOW GRISCOM[2]

ATTRACTED by the glowing reports of a friend of the wealth of bird and plant life in the vicinity of Myrtle Beach, Horry Co., South Carolina, the junior author took a cottage there, and spent a month's vacation from April 4 to May 2, 1932. The senior author motored south via Wilmington, North Carolina, arrived at Myrtle Beach April 17th, and left on April 23rd for Charleston, collecting a few plants northeast of Georgetown en route, and examining a portion of the Elliott Herbarium at the Charleston Museum. On his return north he swung inland through Columbia, and collected a few additional species, not found near Myrtle Beach, on the inner edge of the coastal plain, chiefly in Lexington Co.; and a few more on the outer edge of the Piedmont in Saluda Co. These are listed in a separate section beyond. The junior author spent practically all day every day afield.

The area chiefly investigated, however, was a narrow strip along the coast from the North Carolina line at Little River to the estuary at Georgetown, formed by the confluence of the Waccamaw, the Pee Dee and the Black Rivers. The limit inland was Conway on the Waccamaw River.

The chief excuse for this paper is that no literature in existence

[1] Published with aid to RHODORA from the National Academy of Sciences.

[2] In type long prior to the publication of Small's Manual of the Southeastern Flora, and only partially revised to date.